

IN THE CLAIMS

Claims 1-25 (cancelled)

Claim 26 (new): A method for use with a material library, the material library including a substrate with separate sections, each section having a building block, the method comprising:

introducing a starting material into each section to react the starting material in the presence of the respective building block to yield an effluent;

causing the effluent of each section to emit a photoacoustic signal;

detecting the signals using a microphone;

distinguishing the signal emitted by each effluent from the signals emitted by the other effluents based on differences in transit time required for each signal to reach the microphone; and
analyzing each effluent based on the signal from the effluent.

Claim 27 (new): The method of claim 26 wherein the detecting step includes detecting the signals using also another microphone, and the distinguishing step includes distinguishing the signal emitted by each effluent from the signals emitted by the other effluents based on differences in transit time for each signal to reach each microphone.

Claim 28 (new): The method of claim 27 wherein, in the detecting step, the total number of signals detected is greater than the total number of microphones used.

Claim 29 (new): The method of claim 26 wherein the causing step includes irradiating each effluent with time modulated laser light.

Claim 30 (new): The method of claim 26 wherein the causing step includes irradiating each effluent with pulsed or chopped light.

Claim 31 (new): The method of claim 26 wherein, during the detecting step, the microphone is above the sections.

Claim 32 (new): The method of claim 26 wherein the reaction is selected from the group consisting of decomposition of nitrogen oxides, synthesis of ammonia, ammonia oxidation, oxidation of hydrogen sulphide to sulphur, oxidation of sulphur dioxide, direct synthesis of methylchlorosilanes, oil refining, oxidative coupling of methane, methanol synthesis, hydrogenation of carbon monoxide and carbon dioxide, conversion of methanol to hydrocarbons, catalytic reforming, catalytic cracking and hydrocracking, carbon gasification and liquefaction, heterogeneous photocatalysis, synthesis of ethers, synthesis of MTBE, synthesis of TAME, isomerizations, alkylations, aromatizations, dehydrogenations, hydrogenations, hydroformylations, selective oxidations, partial oxidations, aminations, halogenations, nucleophilic aromatic substitutions, addition and elimination reactions, dimerizations, oligomerizations and metathesis, polymerizations, enantioselective catalysis, biocatalytic reactions, and combinations thereof.

Claim 33 (new): The method of claim 26 further comprising determining the activity, selectivity, and/or long-term stability of building blocks that have catalytic properties based on the results of the analyzing step.

Claim 34 (new): The method of claim 26 wherein each building block is a catalyst.

Claim 35 (new): The method of claim 26 wherein each building block is a heterogeneous catalyst and/or a precursor of a heterogeneous catalyst.

Claim 36 (new): The method of claim 35 wherein the heterogeneous catalyst is inorganic.

Claim 37 (new): The method of claim 26 wherein each building block is in the form of a tube-wall coating.

Claim 38 (new): The method of claim 26 wherein each building block is in the form of an auxiliary support coating.

Claim 39 (new): An apparatus comprising:

a material library having a substrate that includes separate sections, each section having a building block;

means for introducing a starting material into each section to react in the presence of the respective building block to yield an effluent;

a light source configured to cause the effluent of each section to emit a photoacoustic signal;

a microphone configured to detect the signals;

means for distinguishing the signal emitted by each effluent from the signals emitted by the other effluents based on differences in transit time for each signal to reach the microphone; and

means for analyzing each effluent based on the signal from the effluent.

Claim 40 (new): The apparatus of claim 39 further comprising another microphone configured to detect the signals, wherein the means for distinguishing includes means for distinguishing the signal emitted by each effluent from the signals emitted by the other effluents based on differences in transit time for each signal to reach each microphone.

Claim 41 (new): The apparatus of claim 40 wherein the number of sections, and thus the number of signals to be detected by the microphones, exceeds the number of microphones.

Claim 42 (new): The apparatus of claim 39 wherein the light source is a time modulated laser light source.